REMARKS/ARGUMENTS

The Examiner rejects claims 1-9 and 16-28 under 35 U.S.C.§102(b) as being anticipated by EP 0 863 651.

Applicants respectfully traverse the Examiner's rejections.

The present invention, in a preferred configuration, is directed to a resource allocation algorithm that dynamically repositions enqueued calls as new calls arrive such that service level objectives associated with incoming calls as well as enqueued calls are considered equally. The algorithm is particularly useful for a queue having calls of a number of different call types. In one configuration, the algorithm works by comparing first and second quality values associated with placing the new call in first and second queue positions. The queue position having the more favorable quality value is selected for the new call. The first quality value assumes that a currently enqueued call remains in a first queue position while the new enqueued call is placed in a second, later queue position. The second quality value assumes that the new call is placed in the first queue position while the currently enqueued call in the first position is moved to the second queue position. The quality values reflect factors such as weighted advance time, current queue position or estimated wait time, actual time already in queue, and the service level target value for the call type. A detailed discussion of the mathematical relationships for these values is provided at pages 13-16 of the application.

Applicant thanks the Examiner for the interview of September 9, 2004. In the interview, the Examiner requested Applicant to discuss distinctions between each of the "X"-classified references

in the European Search Report. The "X"-classified references are: EP 0 863 651, EP 0 982 917, EP

0 740 450, the Perry et al. article *"Performance Modelling of Automatic Call Distributors:*

Assignable Grade of Service Staffing", and the Jackson article *"Queues with Dynamic Priority*

Discipline". Each of these references is discussed below. With reference to the EPO search report,

Applicant notes that the claims searched by the EPO were identical to the claims as originally filed

in the above-identified application.

The "X"-classified references fail to teach or suggest at least the following italicized features

in the pending independent claims:

> 1. A method for use in managing a call queue within a call center, said
> call queue for handling calls having a plurality of different call types that each have
> a corresponding service objective value, comprising the steps of:
> receiving a new call from an exterior environment, said new call having a first
> call type;
> ascertaining a first service objective value associated with said new call based
> on said first call type;
> selecting a currently enqueued call in the call queue, the currently enqueued
> call having a second service objective value;
> *determining a first quality factor assuming that the new call is enqueued after*
> *the currently enqueued call;*
> *determining a second quality factor assuming that the new call is enqueued*
> *in place of the currently enqueued call, said first quality factor reflecting the first*
> *and second service objective values; and*
> *comparing the first and second quality factors to determine a position within*
> *the call queue for the new call.*

> 16. A system for use in distributing incoming calls to a plurality of local
> agents in a call center, said system comprising:
> a receiver for receiving incoming calls from an exterior environment;
> a call queue unit for use in maintaining a queue of calls to be answered by the
> plurality of local agents, said queue having a plurality of successive queue positions
> including an initial queue position, said initial queue position for holding a call that
> is next in line to be answered by an agent in the plurality of local agents; and

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a call positioning unit for positioning a new call received by said receiver within the queue, *said call positioning unit determining a position within the queue for the new call by determining a first quality factor assuming that the new call is enqueued in a first position in the queue and a second quality factor assuming that the new call is enqueued in a second, different position in the queue and comparing the relative values of the first and second quality factors.*

23.   A method for use in managing a call queue within a call center, comprising the steps of:
　　receiving a new call from an exterior environment;
　　selecting a currently enqueued call in the call queue;
　　determining a first quality factor assuming that the new call is enqueued after the currently enqueued call;
　　determining a second quality factor assuming that the new call is enqueued in place of the currently enqueued call; and
　　comparing the first and second quality factors to determine a position within the call queue for the new call.

EP 0 863 651

EP 0 863 651 is directed to a selection function that selects, for servicing by an available agent, a call from among calls in multiple queues. The function considers the call at the head of the highest-priority non-empty queue of each set of queues from which the available agent is eligible to handle a call and selects the call that is farthest along according to some predefined measure -- either in actual time or as a percentage of the service time objective or as a combination thereof. In a described configuration, the function computes the expired service-time objective ratio 222 from table 220 at step 208. For each of the calls at the heads of the determined call queues 21, the function then computes the expired service-time objective ratio or percentage by dividing the wait time obtained at step 206 by the service-time objective and for percentage multiplying the result by 100 at step 210. If two or more calls have the same expired service-time objective, the function

selects from among them the call which has the highest priority. Alternatively, the function may

compute at step 210 the difference between the service-time objective and the actual or anticipated

wait time for each of the subject calls, by subtracting the wait time obtained at step 206 from the

service time objective, and then selecting at step 212 the call that has the lowest (including negative)

resulting difference. If no call happens to have already exceeded its service time objective, the call

that comes closest to exceeding its objective is selected. If any calls happen to have already

exceeded their service-time objectives, the call that has most exceeded its objective is selected.

<u>EP 0 982 917</u>

EP 0 982 917 is directed to an ACD system 101 including an agent selector 150 that effects

an assignment between available calls and available agents and implements a skill-queuing process.

Queue positions are assigned to a call in the order of the call's arrival. The selector "tags" an already

enqueued call with a value indicating the priority level assigned to the call. Exemplary tags include

"high", "low", and "mid". In step 204, an advantage adjustment is applied to the calls. The

adjustment, which may be in the form of time added to the current wait time of the call, creates an

advantage of a higher value caller over a lower value caller ahead of it in the queue. This enables

calls that are not in the head position in the queue to be considered for service before the call in the

head position. In step 206, the first occurrences of high, mid, and low value tags in the queue are

identified. A call which is identified is included in a call selection consideration pool from which

the next call for a multi-skilled agent will be selected. In step 208, an adjusted wait time is computed

for each of the calls identified in step 206. The adjusted wait time may be computed by summing

the actual wait time for the call with the advantage adjustment determined in step 204 for that call.

In step 210, the adjusted wait times are further processed to determine which call will move into the

call selection consideration pool. Conventional call selection techniques are then applied to select

a single call from the pool. The system does not assign queue position based on relative call priority

but appears to enqueue all calls in their orders of arrival.

EP 0 740 450

EP 0 740 450 is directed to an ACD system having a skills inventory database storing data

indicating the preferences and preference levels of call center management to have specific agents

process calls with specific skill requirement levels. The ACD system compares the skill levels

required by a call with the skill levels and/or preference levels of available agents and distributes the

call to the available agent that has the best skill and/or preference match. A match is best with

respect to skills if the agent is not underqualified to process the call and if the agent is the least

overqualified agent. A match is best with respect to preferences if the call center management most

prefers that the agent handle the call. The call center management controls whether the ACD system

considers skill matches, preference matches or both. Each time a call is received, an initial priority

is assigned to the call. Only in the case of a tied skill match will priorities be considered by the

matching method. To prevent a call from waiting in a queue indefinitely, the priorities of all queued

calls is increased as the length of time in queue increases. When a starvation threshold is passed by

a call's priority, the call is considered to be starved for attention.

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The Perry et al. Article

The Perry et al. article determines the priority of a call through an aging factor, which is a real number used to age the time a call has been queued. For example, if the oldest call in call queue 1 has waited 10 seconds, and the oldest call in call queue 2 has waited 7 seconds, and the aging factors for queue 1 and 2 are 3 and 5, respectively, then the second call would have a higher priority, since the aged wait times are (10x3) and (7x5). When an agent services two different call queues, the algorithm is used to select which call at the head of the queues is to be selected for service. The system does not appear to assign queue position based on relative call priority but appears to enqueue all calls in their orders of arrival.

The Jackson Article

The Jackson article is directed to dynamic-priority queuing systems, in which each customer has a scheduled start time and, if several customers are waiting in line when a server becomes free to serve a new customer, one is chosen with the earliest scheduled start time among those waiting. It is assumed that a customer's scheduled start time is the sum of his arrival time in the system and a random urgency number drawn from a fixed probability distribution. The numbers needed for any given customer are: his urgency number; the interarrival interval between his time of arrival in the system and that of the next-arriving customer, and the holding time required to complete his service once it is started. Customers waiting in a queue are ordered according to increasing start time. Customer scheduled start times can be used to select which customer is to be serviced by a qualified available server.

The above references fail to teach or suggest, individually and collectively, the determination of a first quality factor assuming that a new call is enqueued after a currently enqueued call and a second quality factor assuming that the new call is enqeued in place of the currently enqeued call and the comparison of the first and second quality factors to determine a position within the call queue for the new call. Except for EP 0 740 450 and the Jackson article, the various references do not assign queue positions different from the calls' orders of arrival of the calls. These references use various algorithms to assign relative priorities to the already enqueued calls. The queue positions are used to advance calls to the head of a queue and the priority used to determine which of the calls at the heads of the queues is to be serviced by an available multi-skilled agent. EP 0 982 917 is the only reference that assigns calls to agents notwithstanding their respective queue positions. Simply put, none of the references teaches or suggests the use of hypothetical queue positions for a new call in initially assigning the call a queue position.

Accordingly, the pending claims are allowable.

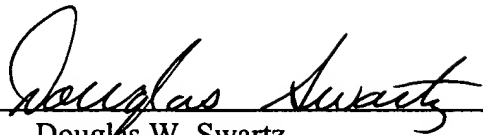The dependent claims provide further bases for allowance.

By way of example, Claims 3-8 are directed to the calculation and use of various ratios, each of which includes estimated total wait time in queue.

Based upon the foregoing, Applicants believe that all pending claims are in condition for allowance and such disposition is respectfully requested. In the event that a telephone conversation would further prosecution and/or expedite allowance, the Examiner is invited to contact the undersigned.

Respectfully submitted,

SHERIDAN ROSS P.C.

By: _____
Douglas W. Swartz
Registration No. 37,739
1560 Broadway, Suite 1200
Denver, Colorado 80202-5141
(303) 863-9700

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